

DOCUMENT RESUME

ED 333 859

IR 015 020

AUTHOR Poage, Julie A.
TITLE Computer Confidence: A Factorial Model for the Prediction of Success in an Introductory Computer Class for Preservice Teachers.
PUB DATE Apr 91
NOTE 10p.; Paper presented at the Annual Conference of the American Educational Research Association (Chicago, IL, April 3-7, 1991).
PUB TYPE Reports - Research/Technical (143) --
Tests/Evaluation Instruments (160) --
Speeches/Conference Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Literacy; Correlation; *Education Majors; Elementary Secondary Education; *Factor Analysis; Goodness of Fit; Higher Education; Introductory Courses; Predictor Variables; *Preservice Teacher Education; Questionnaires; Regression (Statistics); *Self Esteem; Student Attitudes; Surveys; Tables (Data)

ABSTRACT

As education students are faced with the inevitable arrival of computers in classrooms they experience a number of obstacles preventing success in introductory computer classes. The basis for this study suggests that the overwhelming factor contributing to success in such a class is confidence. One hundred fourteen undergraduate education students were surveyed. Each student was asked to report his or her level of agreement to 20 Likert-style items. The final 16-item confidence scale obtained a standardized alpha of .7820. A principle components factor analysis with oblique rotation provided a comparison between four, five, and six factor solutions. It was concluded that the 5-factor model presented the best fit and most parsimonious structure. Using factor scores from the 5-factor solution as independent variables and teacher-rated computer class success as the dependent variable, a regression analysis yielded an R square of .319, $F(5,108)=2.539(p .05)$, thus concluding that the 5-factor solution of confidence contributed significantly to the rated success of students in the introductory computer class. The five factors are identified as (1) confidence in classroom performance; (2) confidence in abilities to learn new materials or techniques; (3) confidence in hardware usage and repairs; (4) confidence in knowledge of content area subject matter; and (5) confidence in abilities to learn using alternative learning styles. A copy of the Computer Confidence Survey is appended. (7 references) (Author/BBM)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED333859

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- ☐ This document has been reproduced as received from the person or organization originating it.
- ☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Computer Confidence:
A Factorial Model for the Prediction of Success in an Introductory Computer
Class for Preservice Teachers

Julie A. Poage
Ball State University
Muncie, Indiana

Presented at the American Educational Research Association 1991 Annual Meeting
April 3-7, Chicago, Illinois

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

Julie A. Poage

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

1R015020

**Computer Confidence:
A Factorial Model for the Prediction of Success in an Introductory Computer
Class for Preservice Teachers**

Abstract

As education students are faced with the inevitable arrival of computers in classrooms they experience a number of obstacles preventing success in introductory computer classes. The basis for this study suggests that the overwhelming factor contributing to success in such a class is confidence. One hundred fourteen undergraduate education students were surveyed. Each student was asked to report their level of agreement to twenty likert style items. The final sixteen item confidence scale obtained a standardized alpha) of .7820. A principle components factor analysis with oblique rotation provided a comparison between four, five, and six factor solutions. It was concluded that the five factor model presented the best fit and most parsimonious structure. Using factor scores from the 5-factor solution as independent variables and teacher-rated computer class success as the dependent variable, a regression analysis yielded an R^2 of .319, $F(5,108)=2.539$ ($p \leq .05$), thus concluding that the 5-factor solution of confidence contributed significantly to the rated success of students in the introductory computer class.

As education students are faced with the inevitable arrival of computers in classrooms they experience a number of obstacles preventing success in introductory computer classes. In this investigation it is proposed that confidence in a number of arenas contribute to the students' success in the computer class, these areas being confidence dealing with hardware and software problems, confidence with subject matter within the major content area, and confidence learning with new materials or techniques. It is also suggested that these areas of confidence can be examined more closely through the formation of a factor structure, resulting in a multiple-factor model of computer confidence. The resulting multiple-factor model can then be used to examine and predict student success in the introductory computer class.

A number of attitude studies have produced instruments indicating factors that contribute to success in computer classes. Gressard and Loyd (1985), having produced the *Computer Attitude Scale*, are among many researchers that suggest computer anxiety, computer confidence, and computer liking to be the primary factors. Subsequently, these surveys have been used in an array of studies measuring the influence of attitude on performance in computer classes, particularly computer programming classes (Alspaugh, 1972; Bitter, 1985; Cramer, 1984; Jones, 1979; Loftin, 1987; Rice, 1984). While the surveys differ slightly, some indicator of confidence appears in most, and thus provides the foundation for this investigation.

Methodology

Sample

One hundred fourteen undergraduate education students enrolled in five sections of an introductory computer course were surveyed. Students included both elementary and secondary education majors.

Instrument

Each student was asked to report their level of agreement to twenty likert style items on the *Computer Confidence Survey* (CCS). The instrument contained five statements describing conditions where the student might encounter computer hardware, five statements dealt with aspects of computer software, five statements questioned the student's confidence in material or teaching in their content area or major, and the final five items expressed abilities to learn new material or learn in a new manner (see Appendix A for original survey items).

Results

The results of this study involved several stages of analysis. In the first stage the data from the original 20 item survey was submitted to a reliability analysis, resulting in $\alpha = .71$. Four items (items 7, 9, 10, and 13) were eliminated from the original scale due to adverse reliability results and to aid in the search for the most parsimonious factor structure. The reliability analysis of the final survey yielded $\alpha = .74$.

In the second stage of the analysis the data (see Table 1 for correlation matrix) were submitted to a number of principle component factor analyses, comparing four, five, and six factor models. The factors were subjected to an oblique rotation due to the presumed correlations between the confidence factors.

Table 1--Correlation Matrix of 16 Item Computer Confidence Survey

	1	2	3	4	5	6	8	11	12	14	15	16	17	18	19	20
Item 1	1.00															
Item 2	.220	1.00														
Item 3	.288	.352	1.00													
Item 4	.145	.082	.402	1.00												
Item 5	.090	.175	.198	.165	1.00											
Item 6	.184	.159	.257	.246	.805	1.00										
Item 8	.161	.157	.304	.146	.467	.436	1.00									
Item 11	.191	.113	.179	.200	.456	.500	.477	1.00								
Item 12	.176	.037	.038	-.058	-.109	-.096	-.004	-.056	1.00							
Item 14	.041	.130	.112	-.089	.122	.068	.043	.047	.333	1.00						
Item 15	-.034	-.058	.091	.092	.163	.154	.065	.131	.098	.215	1.00					
Item 16	.026	.059	.130	.176	.343	.260	.215	.260	-.013	.214	.651	1.00				
Item 17	.146	.068	.257	.198	.197	.168	.128	.188	.060	.186	.391	.569	1.00			
Item 18	.093	.099	.101	.085	.458	.397	.242	.347	.070	.278	.425	.568	.364	1.00		
Item 19	.020	-.089	.129	.175	.101	.176	.179	.145	-.099	.113	.091	.095	.232	.180	1.00	
Item 20	.077	.141	.134	.215	.198	.209	.172	.086	.134	.175	.223	.169	.407	.184	.360	1.00

Results of a principle components factor analysis reported a Kaiser-Meyer-Olkin (KMO) of .71, indicating that the sample matrix was acceptable and that a factor analysis was a reasonable technique. In addition, the Bartlett's test of sphericity (548.128, $p < .0000$) indicated that it was unlikely that the correlation matrix was the identity matrix, again supporting the use of a factor model.

Pattern (factor) structures and final statistics were compared between the models. Table 2 presents a comparison between the four, five, and six factor models. From this comparison as well as an examination of the factor loadings for each model, it was concluded that the five factor model presented the best fit and most parsimonious structure.

Table 2
Summary Statistics for Four, Five, and Six Factor Solutions

	% Variance Explained	Residuals > .05 (%)
4-Factor Model	56.0	68 (56%)
5-Factor Model	63.1	46 (38%)
6-Factor Model	68.8	46 (38%)

The factor loadings for the five-factor solution with values at or above .50 are presented in Table 3. Table 4 groups the items according to their accepted factor structure. Interpretation of these five factors suggests the following factor representation:

Factor 1--Confidence in the Teacher's Classroom Performance

Factor 2--Confidence in the Teacher's Abilities to Learn New Material or Techniques

Factor 3--Confidence in the Teacher's Computer Hardware Usage and Repairs

Factor 4--Confidence in the Teacher's Knowledge of their Subject Matter

Factor 5--Confidence in the Teacher's Abilities to Learn Using Alternative Learning Styles

Table 3
Factor Loadings for 5-Factor Model (Oblique Rotation)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Item 1			.621		
Item 2			.626		
Item 3			.759		
Item 4			.501		
Item 5	.863				
Item 6	.842				
Item 8	.676				
Item 11	.701				
Item 12				.740	
Item 14				.732	
Item 15		.850			
Item 16		.898			
Item 17		.650			
Item 18		.549			
Item 19					.852
Item 20					.728

Table 4
Computer Confidence Scale Items Arranged by Factor Loadings

Factor 1 (Confidence in Teacher's Classroom Performance)

- 5. I would never use a computer in my class because I would be afraid it wouldn't work and I would look silly in front of my students.
- 6. I could never know how to use a piece of computer software well enough to use it with a class.
- 8. Computer programs requires too much time to learn.
- 11. I am afraid to use computers in my class because it may present material I do not know the answers to.

Factor 2 (Confidence in the Teacher's Abilities to Learn New Material or Techniques)

- 15. I am eager to learn more from experts in my content area.
- 16. If the computer presents a question that I don't know the answer to, I will attempt to learn along with my students.
- 17. I am a very good student when new material is being presented.
- 18. I am too slow or old to learn anything new that I could teach my students.

Factor 3 (Confidence in the Teacher's Computer Hardware Usage and Repairs)

- 1. I am never afraid that I will break the computer as I use it.
- 2. I am afraid my students will break the computer.
- 3. I know enough about computers to fix problems as they arise.
- 4. If the computer doesn't work I would run and find someone to help me.

Factor 4 (Confidence in the Teacher's Knowledge of their Subject Matter)

- 12. I am very knowledgeable about all aspects of my content (major) area.
- 14. I constantly read and talk with others about my content area.

Factor 5 (Confidence in the Teacher's Abilities to Learn Using Alternative Learning Styles)

- 19. I do not learn very well when there is little or no written material to use as a guide.
 - 20. I have trouble remembering things that are presented in a lecture.
-

Upon acceptance of the five factor model the factor scores were saved and presented in the third stage of analysis, as independent variables in a regression analysis. Using a teacher-reported rate of success (1=low, 2=moderate, 3=high) as the dependent variable, a regression equation was then generated for the confidence factors.

The regression analysis yielded an R^2 of .319, $F(5,108)=2.539$ ($p<.05$), thus concluding that the confidence 5-factor solution contributed significantly to the rated success of student in the introductory computer class. Beta (β) coefficients, F values, and significance levels of each F are listed in Table 5.

Table 5
Regression Summary Statistics for Confidence Factors as Independent Variables in Predicting Success in an Introductory Computer Class

	β	F	Significance of F
Factor 1	.344	4.057	.0541
Factor 2	.407	4.659	.0399
Factor 3	.281	2.883	.1010
Factor 4	-.237	1.904	.1790
Factor 5	-.237	2.529	.0399

Conclusions

The information presented in this study supports the existence of five factors of confidence related to the use of computers by preservice education students. Interpretation of this solution suggests that confidence is composed of (1) confidence in classroom performance; (2) confidence in abilities to learn new material or techniques; (3) confidence in hardware usage and repairs; (4) confidence in knowledge of content area subject matter; and (5) confidence in abilities to learn using alternative learning styles. The results of this 5-factor model generates the data by which a prediction might be formed concerning the success of education students in an introductory computer class.

Each of the interpreted factors present interesting areas to explore when attempting to improve the performance of education students in computer classes, and ultimately in classroom environments. The results suggest that a number of confidence factors independent of the uses of technology may influence their success in an introductory computer class. These factors might be influenced either prior to the computer class or within the structure of the class itself. That is, instructional techniques might be utilized that build a student's confidence in their own teaching performance and knowledge of content area subject matter. And ultimately, that the introductory computer class is the appropriate forum for building not only teachers' knowledge but also confidence in their uses of the technology.

A follow-up study concluding the amount of time these students spend utilizing the computer as an instructional tool either as student teachers or beginning classroom teachers, would provide additional insight into the impact of confidence on successful computer experiences.

References

- Alspaugh, C. A. (1972). Identification of some components of computer programming aptitude. Journal for Research in Mathematics Education, 2, 89-94.
- Bitter, G. G., & Lu, M. (1988). Factors influencing success in a junior high computer programming course. Journal of Educational Computing Research, 4(1), 71-78.
- Cramer, S. E. (1984). Cognitive processing variables as predictors of student performance in learning a computer programming language. Dissertation Abstracts International, 45, 3583.
- Gressard, C. P., & Loyd, B. H. (1985). Validation studies of a new Computer Attitude Scale. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, Illinois.
- Jones, J. L. (1979). Predicting success of programming students. (ERIC Document Reproduction Service No. ED 178 151)
- Loftin, R. D. (1987). The evaluation of selected variables as predictors of achievement in computer programming. Dissertation Abstracts International, 48, 821.
- Rice, G. E. (1984). An investigation of selected variables for the prediction of computer programming performance of secondary school students. Dissertation Abstracts International, 45, 1006.

Appendix A--Computer Confidence Survey

- + 1. I am never afraid that I will break the computer as I use it.
- 2. I am afraid my students will break the computer.
- + 3. I know enough about computers to fix problems as they arise.
- 4. If the computer doesn't work I would run and find someone to help me.
- 5. I would never use a computer in my class because I would be afraid it wouldn't work and I would look silly in front of my students.
- 6. I could never know how to use a piece of computer software well enough to use it with a class.
- * + 7. **Computer programs can teach many things that I could never teach in my classroom.**
- 8. Computer programs requires too much time to learn.
- * - 9. **Computer software is just an electronic form of standard workbooks.**
- * - 10. **Computer software contains errors and will only confuse and frustrate my students.**
- 11. I am afraid to use computers in my class because it may present material I do not know the answers to.
- + 12. I am very knowledgeable about all aspects of my content (major) area.
- * + 13. **I do not need to know everything about my content area to be an effective teacher.**
- + 14. I constantly read and talk with others about my content area.
- + 15. I am eager to learn more from experts in my content area.
- + 16. If the computer presents a question that I don't know the answer to, I will attempt to learn along with my students.
- + 17. I am a very good student when new material is being presented.
- 18. I am too slow or old to learn anything new that I could teach my students.
- 19. I do not learn very well when there is little or no written material to use as a guide.
- 20. I have trouble remembering things that are presented in a lecture.

7 Positively stated items.

9 Negatively stated items.

* Items removed in final analysis.